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the independent journal of energy conservation, building science & construction practice

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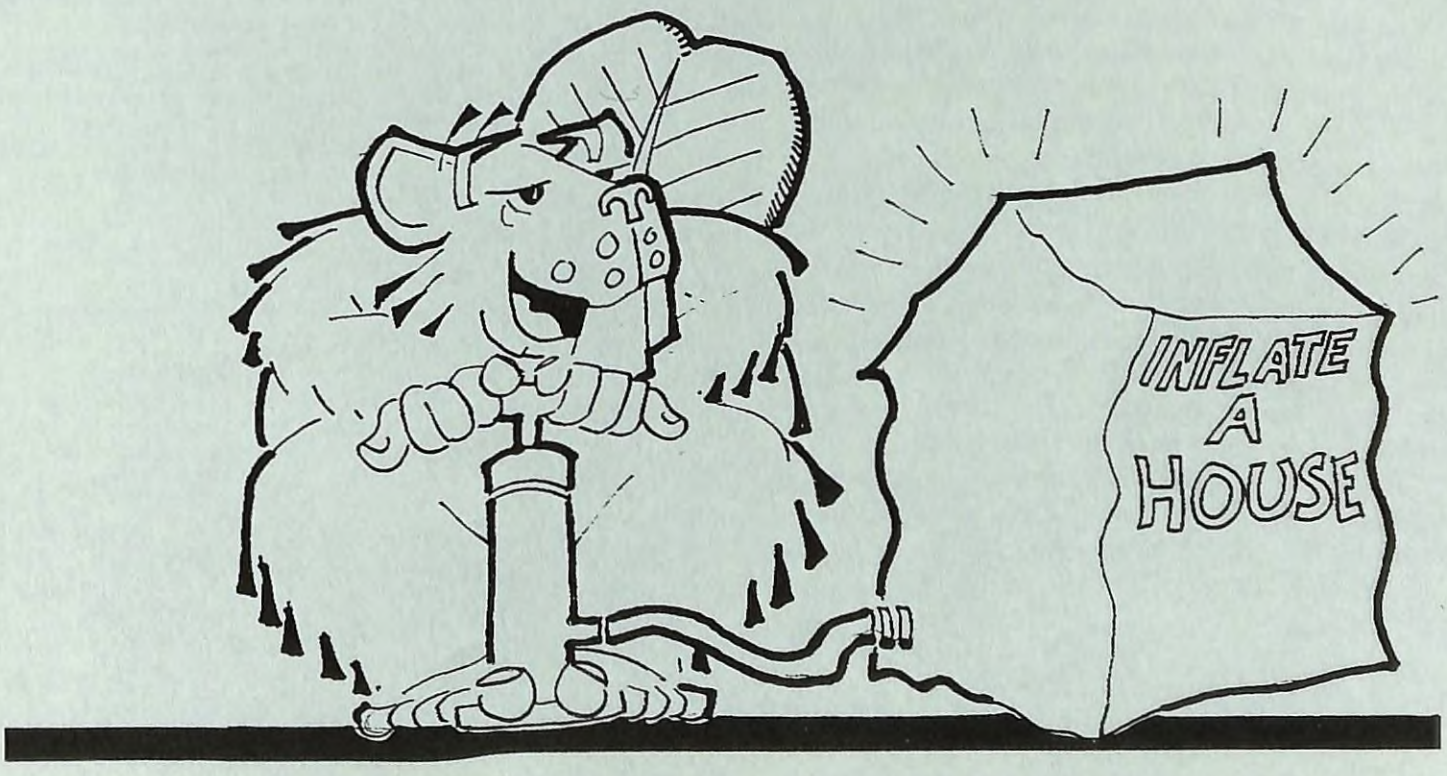

From the Editor . . .

I've heard there is a growing rumble in the construction industry about the move towards greater regulation of "green" issues. The thinking goes that R-2000 has gone too far into the environmental issues, and since R-2000 standards seem to be a foreshadowing of code changes, it is only a matter of time before these kinds of regulations become mandated for everyone.

We can have a heated discussion about the merits of specific regulations, and whether or not they go too far, but it would be wise for the industry to consider to long term future and take hold of the environmental issues and make them their own.

Environmental issues may be a bother at times, and they may not be the sexy front line concern in the public mind at the moment, but it's clear that our industrial development has had a major impact on the global ecology, and the construction industry is a big portion of the problem. If you think that's overstating the case, think about the tons of waste produced even on a modest project - it's not all beyond re-use, nor does it all have to be created in the first place.

The impact of human industrial activities may soon not be reversible unless action is taken quickly. Some environmentalists say that we only have 10 years to clean up our act or it will be too late. But whether it's 10 years or 25 years, we know that the situation is serious. Think about it - what kind of world are we leaving our children and grandchildren?

In case you think this is alarmist, then just ask the fishers on the Atlantic coast how the fishing is going; or the Inuit in northern Canada who are getting exposed to industrial pollutants known only to southerners in smog filled cites; or the Ukrainians displaced from large sections of their country by the Chernobyl nuclear accident; or the BC loggers how much cedar they log is second growth; or the citizens of the US midwest still recovering from the unprecedented Mississippi river floods; or any of the many other local and regional ecological disasters that seem to be coming more frequently.

It is time that our industry took aggressive proactive action on the environmental front. The public is receptive to green initiatives, but they have to be given the opportunity. If we don't want to be saddled with unworkable regulations, we must show the good will and evidence that we can move in the direction of real change without resorting to regulations. No regulations tell you that you must install wall to wall carpeting - the expectation is there that you do so, simply because of the marketing efforts of the floor covering industry. I believe the same can be said for environmentally sound construction.

That is why the R-2000 and Envirohome initiatives must be encouraged and promoted agressively. If such initiatives are not supported and promoted otherwise the general public can legitimately question the sincerity of the industry when it tries to persuade against the imposition of unworkable regulations.

Richard Kadulski
Editor

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Construction Alternatives

So we don't build houses like they used to?

Everyday we tell our customers that construction today is different than it was in the past. What we build today is in fact much better. At the same time, if you thought the big changes in construction technology are slowing down you're wrong! Changes in products and technologies are coming at a fast and furious pace.

While some new products and systems are merely the same old thing in a new wrapper, others are significant changes driven by many different forces - customer expectations, traditional materials shortages, new regulations, environmental concerns, energy conservation, and general product enhancement. Competitive market pressures are seeing the emergence of alternative building systems.

Traditionally, our home building industry has been based on timber but we are reaching the limit of available old growth wood supply (the core of our lumber source). Sustainable forestry practices are only now starting to emerge. Other materials are trying to fill the gap. The competition is getting fierce as new players aim to get a piece of the market share.

Steel

The steel industry has been aggressively promoting steel framing, aiming for a quarter of the housing market by the turn of the century. Unfortunately, they are doing builders (and themselves) a disservice by soft pedalling detailing problems, especially thermal bridging. In the case of steel stud exterior walls, it is possible to use rigid sheathing insulation to provide a thermal break. However, I haven't seen any satisfactory resolutions to thermal bridging through steel roof trusses.

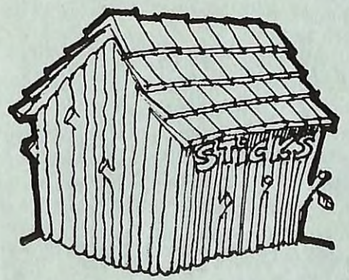
A steel industry representative told me they are not really ready to promote steel construction, but there sure are a lot of brochures enticing builders to build all steel houses (including steel roof trusses)! Even more disturbing, at this early stage, consumers are getting sold on the idea!

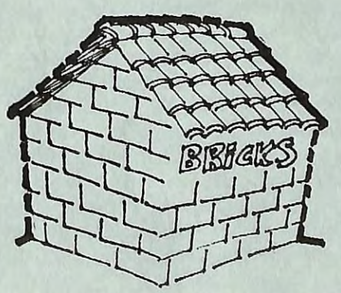
Concrete

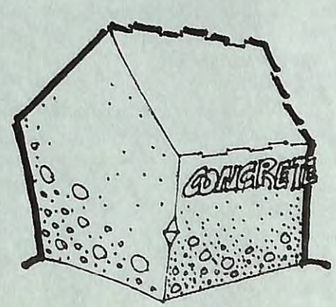
Now, the cement industry is jumping into the battle, especially since the development of insulating concrete form systems which make insulation and forming easier. They are being promoted for use not just in foundations, but also for above grade construction. Portland Cement Association literature proclaims that "Home Building doesn't have to be hard work. It can be as easy as child's play. All it takes is a little imagination and the right materials. Like concrete and polystyrene. Two simple materials that combine superior strength and insulation with the ease of toy building blocks".

There are two basic types of insulating concrete forms on the market. One uses hollow polystyrene blocks that stack or snap together due to their interlocking design. The other uses panels with a system of metal or plastic ties to space them apart. The ties - or webs in the case of block systems - double as seats for reinforcing bars. Once assembled, a workable and flowable concrete mix is placed in the forms-usually by pump.

As the form systems also insulate the concrete from extreme heat and cold, concrete placing can be done year-round







in most areas. They also provide a good curing environment so the concrete gains maximum strength naturally, regardless of the weather.

Insulating concrete forms combine framing, insulation, sheathing and air barrier into one step. Since the forms are part of the finished structure, construction site waste is drastically reduced and what little waste there is can be recycled.

The end product is dependent on three aspects: the form design; the quality of the concrete; and the workmanship during installation (regardless of the system used, effectiveness is dependent on the standard of workmanship.)

Polystyrene forms can be easily cut and trimmed to any shape. Some systems, especially the panel and tie systems, are easy to modify on site to custom designs or site conditions. On the other hand, the block systems are a bit more difficult, especially the ones that have complex interlocking shapes. Some systems get around the problem by having a number of filler and corner pieces, but it could lead to a situation where you have to have quite a large number of different pieces on site (so what happens if a couple of key pieces get damaged, and the warehouse is 100 km away?).

In conventional concrete, gravel aggregate ranges in size for ½" to 1½". The larger the aggregate size, the more economical the concrete mixture.In the case of concrete for the foam form systems the maximum size of the aggregate should be selected in relation to the narrowest dimension between the sides of the form, the minimum clear spacing between reinforcing bars, and the minimum spacing between the reinforcing bars and the sides of the form.

While these systems do seem simple, there are a few words of cautions that the salesmen will try to gloss over. The most important point is that you have to have a level surface from which to build up the forms. Extra care and attention with the concrete footings will repay itself through the ease of erection later.

While the forms are self supporting, special care must be given to support the formwork in order to hold the alignment and plumb during stacking of the forms, placement and hardening of the concrete. Means must be taken to prevent the first course from moving; the forms have to be tied down to prevent lifting or floating. This is important if you want to maintain straight plumb walls and avoid having to correct irregularities due to the form taking a hike or bow. Concrete should be placed in a continuous operation and in uniform lifts. No movement to align forms after concrete has achieved set should be permitted.

To prevent damage from backfilling it is necessary to provide protection to the foam at and above grade.

Preplanning of services is also important - you don't want to have to fight the system later to put in plumbing, conduits, nailing plates, or whatever.

It also means having to think through all finishes. Sure, you can screw or nail the drywall to the forms. But what about wood trims later on? Most of the form systems incorporate built-in components that allow you to screw interior and exterior finishes to it. Drywall can be attached directly to the surface with self-tapping screws or special adhesives. Any siding material is generally easily attached to the exterior, although full brick veneer requires attention to provide adequate support..

Foam forms and basement moisture

Foam form systems can act as a capillary break for the concrete wall (this is what the black damproofing applied to concrete does)..The advantage of the foam form systems is that they eliminate the need for form ties and tie cut-offs which are usually responsible for moisture problems associated with capillary effect.

The use of EPS as a drainage layer material is presently being studied by the Institute for Research in Construction.

Cheaper? Definitely not compared to standard, minimum framing practices.

Prices vary but insulating concrete forms generally cost about 5 - 10% more than conventional wood frame construction. A comparison between insulating forms,

R-2000, and conventional wood frame construction showed initial costs for the insulating form home to be a bit less than R-2000 and a bit more than conventional wood.☼

In recent years there has been lots of interest in alternative building forms, from earth shelters, to domes to yurts, someone's been trying to do something. different. Now there is an increased interest in alternative materials.

Straw Bale Construction

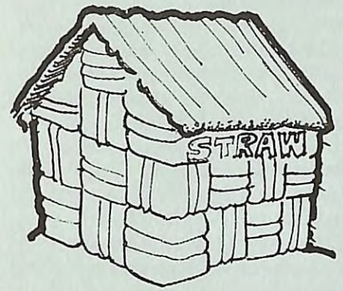
It may sound like something out of child's story book, but there is a growing number of people trying to build straw bale houses. If you are after a low-tech, organic look, straw bale construction is one material to consider. Straw bale construction has had a resurgence of interest. Some estimates place the number of building starts using straw at about 150-200 units this year, and growing.

While most of the activity and interest seems to centred in southwestern US, there is some interest in the Quebec and northern New England area as well. New Mexico has drafted regulations so that building inspectors can be more comfortable when evaluating and approving straw bale projects.

It's not only used for houses. The Real Goods Trading Co., a major US supplier of "alternative" energy products is building a new showroom and warehouse in Ukiah California using straw bales for walls. Other buildings being built with straw include a church and a winery.

Why straw?

It's a relatively inexpensive, natural product (low embodied energy) with good

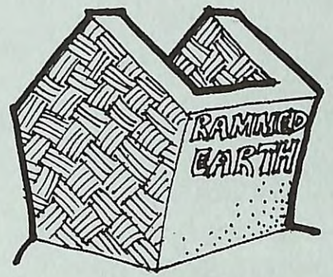


insulating properties - although to get a good R-value and structural strength the walls are about 2 feet thick. Surprisingly, the bales do have structural properties also. However, if you have a need for perfectly square, dead level construction, this is not the material for you.

Nor is it suited for wet and damp climates, because it is not easy to maintain the construction completely dry and installation of vapour barriers is a bit tricky, although further study needs to be done. ☼

Rammed Earth

Another interesting material is rammed earth. Unlike adobe, which essentially is sun dried straw reinforced mud bricks, rammed earth makes use of portland cement. In rammed earth construction, soil and cement is mixed on site and placed into forms with some compaction. The nature of the soil in an area gives the finished product its distinct colour, rather than just the grey of standard concrete.



While rammed earth sounds like a real down home low-tech building approach, it can also be very high tech and elegant. Dave Easton in Sonoma, California, who has pioneered rammed earth construction, finds that most of the clients for his design build business in California are the well to do. The elegant houses (you could call them mansions) are very far from the "granola" image you might have when thinking about earth construction.

Concrete Housing Handbook

Wood has long been the preferred house building material due to its availability, ease of use and low cost. Builders have relied on wood for so long that its is hard to change practices even in the face of reductions in quality, supply and huge price increases.

Most housing in Canada is built to standards laid out in Part 9 of the National or Provincial Building Codes. To have concrete products generally accepted in housing, the most direct way is to have concrete components detailed in Part 9. In its drive to encourage wider use of concrete, the Canadian Portland Cement Association has produced a concrete housing handbook.

It includes a proposal to have concrete floors included in Part 9 of the code. It is written in building code format and was submitted in 1993 to be considered for the 1995 revision of the Ontario Building Code. At the time Ontario code authorities were not prepared to consider the proposal.

It is the first time in Canada and probably the U.S.A. that concrete floors and walls above grade for single family housing have been proposed for inclusion in a building code.

The hand book includes the Proposed Code Amendment which was submitted.

Why bother considering concrete construction? It is non-combustible construction; noise proof- a good sound barrier (especially for walls); squeak proof - concrete floors don't squeak;

energy efficient- concrete can store the sun's energy (if solar design is properly incorporated).

The information in this book was selected and arranged to give builders easy access to technology that up until now was available only to thee few who are familiar with large scale heavy construction (Part 4) design procedures.

Three illustrated construction guides are included as appendices. These cover Prestressed

Hollow core Concrete Floor Slabs; Composite Steel Deck and Concrete Floors; and

miscellaneous structural components including Cast-in-Place Concrete Fire and Sound Separation Walls.

For information:
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Fax 416-449 9755

Our feature storey on Frost protected shallow foundations (Solplan Review #56) prompted Robert Fraser, of Dartmouth, NS to write about his project which contains a number of innovations.

Frost protected shallow foundations, dynamic windows and passive solar design

Dynamic windows

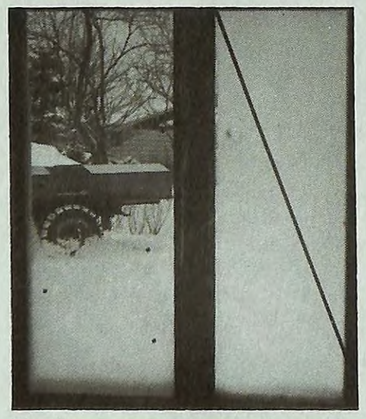
These are also known as laminar flow windows. Dynamic windows work on the principle that heat loss through the window preheats air that is drawn into the house through the window.

Dynamic windows require a negative air pressure in the house in order to function, as the incoming air is the replacement air to match exhaust air flow. The total amount of incoming air is determined by the amount of exhaust air flow. In this house, the two bathroom fans and the range hood are on rheostat switches. There is no dedicated make-up air for the wood-burning stove; all the make-up air comes into the house via the dynamic windows.

The house is otherwise airtight; it tested at 1.04 air changes per hour at 50 pascals (compared to the R-2000 standard of 1.5) with a blower door test done with the dynamic window openings (which total one square foot) sealed up for the air test. For this type of ventilation strategy the building must be airtight otherwise it will not work.

As in any HRV system the efficiency of the system depends on the rate of flow as the incoming air picks up the conductive loss of the interior unit but not its' radiant loss.

The house has five dynamic windows all of which face south and are located on the upper floor. They are site built units using two double glazed panels. (A few years ago, Willmar Windows experimented with a dynamic window, and had a production model but they eventually dropped the line). When there is a strong south wind a slight draft can be felt by the window slots. Otherwise, the windows take advantage of the stack effect in the house, as in order for the air to circulate backwards (out) through the windows (which are located on the upper floor) the resistance of buoyant warm air would have to be overcome to push it down. The relative air tightness of the house helps to prevent backwards circulation.



Two dynamic windows during construction. The one on the right is only a single glass unit, while the one on the left has both inner and outer glazing, and shows how the incoming air is warmed up above the dew point.

There has been no condensation problem associated with the dynamic windows. Once when the house was still under construction, just locked up but with snow inside the house, one of the windows had its' exterior thermo pane units already in place and one without. The normal thermo-pane unit had condensation covering the complete inside but the window with the exterior unit in place had condensation only on the bottom third, showing that the exterior air was being warmed up as it rose between the units.

Do the windows work? Formal tests have not been done, nor is there any monitoring equipment to determine how much air flow there is, or what the temperature differentials are. However, the house is finished and it appears to be working well. During the two coldest weeks of the winter with temperatures dropping into the -20°C range at night and a wind chill factor approaching -40°C the temperature dropped to 6°C even though the heat has not been turned on. Generally the temperature varies between 8 and 14°C.

Frost protected shallow foundations

The house is built on a floating structural slab with perimeter insulation extended 3 feet past the house.

The insulated slab is designed to store excess heat. A thermostat controls a fan which circulates solar heated air when it reaches 23°C. On any sunny day the air is pulled down over and through the concrete slab to store the heat from the sun. Even with the 270 cfm fan (usually run at half speed) moving warm air from the top of the sunspace to the floor slab, the upstairs of the house is usually warmer than downstairs as is typical of most solar heated houses. This should be acceptable for people living in the house as the main living area is upstairs (accessible directly from the street) and the bedrooms are downstairs.

The same fan also pulls warm air heated by the wood burning stove from the ceiling down and across the concrete slab as is done with the solar heated air.

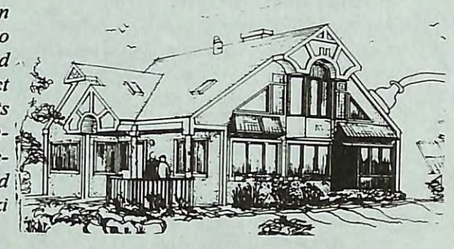
Passive Solar System

Last summer we found that overheating is not a problem as most of the glazing faces South and with triple and quadruple glazing with Low-e coatings and a reasonable overhang there is lots of reflection off the glass due to the high angle of incidence of the sun to the glass in the summer.

In addition to the passive solar gains, there is a solar water pre-heater. The solar panels are inside the solarium, thus avoiding the need for freeze protection for the panels. The system is working well. After a sunny day the coldest water in the 60 gallon storage tank is 37°C and the temperature at the top from where it feeds the electric hot water tank reaches 42°C. With no sun and no draw down the water in the tank will stay warm for more than two days. ☼

Anyone looking for an energy efficient, passive solar house in the Halifax area? This home, at last report, was still for sale.

The Alberta Sustainable Home in Calgary is a 1750 sq. ft. house built to showcase healthy, environmental and energy conserving features. The project also demonstrates that interesting projects can be executed by private initiative without government funding. The construction of the house has been built and financed by Jorg and Helen Ostrowski with a conventional mortgage.



Alberta Sustainable House

What Is A "Sustainable" Home?

A Sustainable Home is one which treats resources and environment with enough foresight to be appreciated by our grandchildren.

The design of the house is based on occupant health, environmental responsibility, energy efficiency, and affordability. It takes advantage of the simple fact that the sun's light and heat energy are free. Active living spaces on the south side provide maximum solar penetration and the slab-on-grade floor (there is no basement) stores the solar energy in its thermal mass. Interior spaces are adaptable and avoid duplication of spaces.

Materials and finishes were selected with emphasis on natural, non-toxic products and those which have recycled content and low embodied energy. Examples include: cellulose insulation (which is recycled newspaper); interior partition studs using 30 year old wood; concrete without chemical additives; VOC - free finishes; no synthetic carpets.

By careful design of the building and materials selected it is estimated that 35 trees were saved.

A heat recovery ventilation system removes stale contaminated air and provides a constant supply of fresh prewarmed air, as well as humidity control.

Water systems are designed to conserve treated drinking water and to avoid contaminating this precious resource with sewage effluent. Water for domestic use is collected rain water stored in a cistern in the back yard. It is estimated that 61,000 litres per year will be collected. Drinking water is filtered and treated.

Greywater from showers and sinks is collected and used through drip irrigation to water the yard. The waterless (composting) toilet, eliminates the need for 40 to 50,000 gallons of treated drinking water per year, and produces fertilizer for the yard without requiring sewage treatment.

Overall, this approach is expected to save about 238,2000 litres of treated drinking water per year.

The design emphasizes reducing the environmental impact of housing based on the 5R's - Rethink, Reduce, Reuse, Recover, Recycle.

Rethink means reconsidering the "conventional" way of doing things and finding more environmentally appropriate way of living. For example are basements necessary? Are there better roof and wall assemblies? Are there cost effective alternatives to toxic materials? What are the benefits of using native and natural plant materials for landscaping?

Reduce means reducing the consumption of precious and non-renewable resources and construction waste. For example use of the sun's energy reduces fossil fuel use. Putting dry wall cut-offs in the cavity walls to increase the thermal mass and it also reduces landfill.

Reuse refers to reusing products and materials which still have a useful life. For example reusing wood, plumbing fixtures and doors from demolished buildings.

Recover/Recycle means being responsible to the environment by sorting and recycling materials for further use and choosing materials and products which have recycled content. As examples, metal joist webs in engineered wood truss type joists have 60% recycled content, floor tiles are made from recycled glass, refurbished bathtub, door frames from the roof of a bakery which was being demolished.

Energy Efficiency:

The design stresses energy conservation, passive and active solar design, and products with low embodied energy. Embodied energy is the accumulated energy contained in a product from extraction, manufacture, transportation, and disposal.

Conservation of energy is demand side management, and the best way to conserve energy is to reduce the need for it. The design is based on air-tight construction, high insulation values (walls R-50, roof R-74), high performance windows (centre of glass R-12; one unit is R-17), energy efficient appliances and direct current (DC) lighting. The majority of windows face south to get the most benefit from the sun's daylight and heat.

Alternative energy sources are supply side management. Where energy must be provided it should be as environmentally responsible as possible. The house is not connected to natural gas. Energy for space heating is provided by active and passive solar, a high efficiency masonry wood burning fireplace and heat from the ground. Warm air that convects naturally to the ceiling is blown back down into the concrete slab through air tubes. Water heating comes from a passive solar thermo-syphon collector. Electricity is in part supplied by a grid connected photovoltaic system and a sterling engine. This reduces the need for electricity generated by burning coal (the source of Calgary's electricity).

Affordability.

The emphasis is on cost-effective and appropriate technology. The basic house is cost-competitive with a conventionally built house, but operating costs are reduced an estimated $1,300 per year (for gas, water, electric).

The reduction of electricity usage is predicted to be 10,000 Kwh per year. Because electricity in Alberta is primarily generated from coal, they estimate that the reduction in electricity usage avoids the mining and combustion of 5,000 kg of coal per year. This also reduces the production of greenhouse gasses (CO_2, SO_2 NOX, particulates) by about 18,500 kg per year. However, the photovoltaic panels are predicted to generate about 5,000 Kwh of electricity per year.

Information:
Autonomous & Sustainable Housing Inc.
9211 Scurfield Dr. N.W.
Calgary, AB T3L 1V9
Tel: (403) 239-1882
Fax: (403) 547-2671

Compact Fluorescent Lighting Directory

Iris Communications has released a new directory available on computer diskette that contains more than 8,000 products from 100 manufacturers. The directory lists detailed specifications for each model of fixture, lamp and retrofit kit. Self-ballasted lamps and modular ballast adapters also.

Information has been updated and is current for 1995.

Information:
Iris Communications, Inc
Eugene, Oregon
Tel: 503-484-9353

Solar House Law

The **Solar Letter**, a Washington DC newsletter reports that the Himachal Pradesh state government in northern India (in the Himalayas, with extreme winters) is planning changing its building laws to provide incentives for people to heat their homes with solar power.

Passive solar architecture is expected to save 60 - 70% of the fuel required to heat buildings

(including electricity, wood, coal and kerosene), at an expected incremental building cost of 3 - 5%, or up to 10% if special insulation and other materials are used. ☼

Wanted: Slides of construction innovations

Many innovations are done by builders on the job site but they don't always get reported. Warren Jones a Vancouver builder (BC Advanced House, Vancouver Healthy House, R-2000 construction) also does R-2000 training in BC.

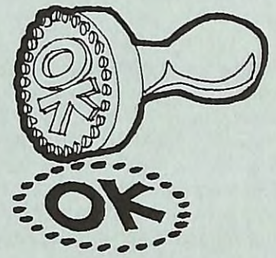
He believes that there are many innovations that may be of great use to other builders, but they don't always get exposure. He says that "when you are required to attend an up-date course the most popular thing I hear is that builders want to know what is new and what is being done in other parts of the country" With this in mind, he is compiling an updated slide presentation to show new ideas for discussion at seminars.

If you have anything interesting, even the simplest detail that could be interesting, please let Warren know. Costs of duplicating slides may be covered.

You can contact Warren care of **Solplan Review**.

ISO 9000

You've seen references to ISO 9000. But do you know what is it?



ISO 9000 is an international set of standards to assess quality control management systems in any organization, large or small.

ISO 9000 provides a third party assessment that can be used as a tool for ensuring quality as well as safety, and offers protection against risk and liability to builders and manufacturers of housing products. Customers are gain the confidence that companies will consistently deliver the quality expected.

Canadian homes are well built and reflect some of the highest construction standards in the world. However, builders usually wait until a project is well along before applying detailed inspections and post-production adjustments to ensure quality. This can increase construction costs. ISO provides a means for controlling construction quality through prevention as opposed to correction, which can save money.

An appropriate application of ISO 9000 within the construction industry is in the area of manufactured housing. Triple E Homes Ltd of Lethbridge is one manufacturer that has begun the registration process.

In the long term, the use of ISO 9000 could eliminate or significantly reduce the inspection process. For example, if a builder was ISO 9000 certified, his construction or assembly could be accepted as evidence of meeting building codes and he would not need to be inspected, but the elimination (or reduction) of inspections would be a major change in municipal and provincial government operations.

Quality management requirements defined in the ISO 9000 series of standards should not be confused with product or service certification but rather to the systems that produce them. They are complementary (not alternative) to the technical requirements of specific products or services. They are generic, applying to all industries.

ISO 9000 standards don't replace any part of the National Building Code. However, in the construction industry ISO 9000 standards could provide assurance to purchasers of buildings or building materials that builders (or manufacturers of building materials), have the necessary procedures and quality checks in place to ensure consistency of performance, timeliness in delivery and adherence to appropriate building (or materials) standards.

How is quality defined?

The definition of quality is that the product meets the requirements of the user/customers and that production is controlled in such a way as to ensure reliability, consistency and timeliness of the product. Whenever something goes wrong, the system should allow the organization to easily identify where corrections are needed. Each step must be defined and quality checks must be built into each stage.

The ISO 9000 standard is actually an umbrella label for a series of standards. To comply the quality system must be fully documented. This forces discipline and entrenches the commitment to quality. The assumption is that if all personnel were suddenly replaced, the new people could use the documentation to continue making the product or providing the services as before. The auditing process that is part of the ISO 9000 provides the proof of performance.

ISO 9001 covers organizations where design and product development is the major activity, such as engineering and construction firms and manufacturers that design, develop, produce, install and service products.

ISO 9002 covers manufacturing firms and is for use when conformance to specified requirements is to be assured by a supplier during production and installation only. It is suited to industries such as chemicals and pharmaceuticals.

ISO 9003 covers organizations where the quality of the final product or service can be assessed solely by virtue of the final inspection and testing routines. It is suitable for small shops or equipment distributors that inspect and test supplied products.

Companies must register and be accredited to use the ISO 9000 designation (initial registration is generally good for three years). The process includes the evaluation of the applicant's quality system, including an on-site audit of procedure compliance. If the audit is successful the registrar places the applicant on its register/listing of ISO 9000 companies. Audits are performed randomly to ensure ongoing compliance.

ISO 9000 registration also provides companies with an opportunity to gain a competitive advantage. Companies that have already adopted ISO 9000 have also cited reduced costs as one of the many benefits.

There is also the possibility that it may limit product liability exposure. A company may have a stronger defense in a liability suit if it has a quality assurance system registered to one of the ISO 9000 standards. ☼

Materials for a healthy environment: a Primer

With the concern for indoor air quality it has been recognized that source control is the best strategy to follow. If you don't use a product, it's not going to create a problem. That is why R-2000 has moved in this direction by creating pick-lists of appropriate materials to use. We continue our investigation of building products for healthier indoor environment.

It's not always possible to avoid using products that contribute contaminants, but the harmful effects of some materials can be reduced by careful finishing and sealing. We know that formaldehyde is a major contaminant of the indoor environment (much of it originating from particleboard - a major contributor of indoor formaldehyde) but many other products used today in construction are made from a whole catalogue of chemicals, many very toxic.

Using healthier products has a bonus: workers on site will suffer fewer side effects and won't get high at work! (Ever notice how many product labels say to "use only in a well ventilated space"?

Adhesives

Low-tox water-based adhesives are safer for occupants and trades-people, and in most situations they are equally as good (if not better) than some of the more toxic solvent based compounds.

White Wood Glue is a relatively non-toxic during and after normal use.

Contact Cements contain synthetic resins or a natural latex. Petroleum-based solvent types contain xylene, formaldehyde, hexane, toluene, naphthalene, phenol, or petroleum spirits, and should be avoided. Water-based types, normally contain ethanol, ammonia, glycol, and microorganism-inhibitors. Water clean-up and good performance make this type the preferred option to use.

Construction Glues used with caulking guns are similar to the petroleum-based contact cements, but with added fillers and resins to make them very sticky. When used indoors these will off-gas for a long period.

Flooring adhesives should all be water dispersion, low-toxicity formulations.

Ceramic Tile Adhesives & Grouts

The traditional method of attaching ceramic tile is a pure cement paste over a 1¼" bed of mortar. Today there's a tendency to use thin set mortars. Silicone-modified cement-based thin-set mortars are acceptable. Generally, the commercially-available mortars that require damp-curing (kept moist for the first 72 hours to increase strength) are the most tolerated. Some tiles are set with mastics that can contain vinyl, epoxies or furans and can emit odours, and these should be used with caution.

Caulking

We are now using more caulking compounds than ever before. Some are being used to better air seal buildings; others are used in the normal course of joinery. As a general rule, caulking compounds designed for exterior use should never be used indoors.

Products normally formulated for indoor use are made of acrylic latex or silicone.

Latex caulk is the safest of all caulks. It is made with synthetic latex mixed with fillers, glycol and pigments. Its environmental risk is similar to that of the latex paints and can be cleaned up with water.

Acrylic caulk is made with acrylic resins blended with latex, petroleum solvents, glycol and fungicides has similar health risks to acrylic latex paints.

Silicone caulk contains silicone resin and acetic acid (vinegar). Once cured, it has the lowest risk to health of any indoor caulk. It forms a chemically stable rubber that is heat-resistant, fairly odourless, extremely durable and resists humidity. It cannot be painted, must be cleaned up wit solvents, and does not stick well to rough wood or to concrete.

Caulkings to avoid for indoor use include the solvent-based types such as the urethanes, butyls, and polysulfides which are made with solvents like methyl ethyl ketone, acetone, xylene, and toluene. Since they are designed to remain flexible, they can off-gas for long periods of time.

R-2000: Business as usual

The latest Federal budget introduced major cutbacks and announced many structural changes in federal government operations. Although many programs are slated for drastic shake-up if not complete elimination, the R-2000 program will be continuing..

In common with all energy efficiency programs, there has been a modest budget cut, but this should mean no significant changes. For the past few years the program has in fact been administered by the Canadian Home Builders Association with a number of program partners in each province, so that the Federal contribution does not cover the full cost of adminstration. In many respects it is business as usual.

This represents a positive vote of confidence in a program that has significant industry participation and been a major force in advancing building technology in the residential housing sector. ☼

Engineered Wood Products

The desire for resource efficiency and optimum timber utilization means greater use of engineered wood products. These are manufactured with a variety of bonding compounds. Most are very stable compounds, with limited emissions after the construction period is finished, so in most applications they are safe to use indoors.

Manufactured wood I floor joists are generally made with phenol-resorcinol and isocyanurate glues.

Composite panel boards

Canadian made plywood is mostly exterior grade, manufactured using phenol-formaldehyde glue and thus off-gasses relatively little. Interior plywood is normally made with urea formaldehyde glues, which is why they are a source of concern. This is also the case for particle board and MDF boards.

Medite II, manufactured in Oregon, is one MDF board that does not use area formaldehyde resins. Later this year another plant, using a process developed by Canfibre is to start production in Oakville (this plant will also be using recycled wood fibres).

Drywall

Gypsum drywall is composed of paper and gypsum, with no significant additives. However, it is porous so it can act as a VOC-sink, absorbing gasses and volatile organic compounds in the factory and warehouse (even cigarette smoke during construction).

Lumber

Cedar contains long lasting resins that are toxic to moths, insects and many other organisms. Some people are also very sensitive to it.

Treated Wood Products

We treat wood to prolong its useful life span, especially if it is being used outdoors, or where it is going to be in contact with moisture. It is best to try to remove the source of moisture, but when it can't be avoided then treated wood may have to be used. Regardless what kind of treated wood is used, it is best to keep such material outside.

Waste disposal can be a problem - treated wood scraps should not be burned. In areas where wood waste is recycled for agricultural and compost uses, it must be separated to keep the toxic products from contaminating the soil.

A range of products are used to pressure wood. The most common treatment products are:.

CCA (Chromated Copper Arsenate) and **ACA** (Ammoniacal Copper Arsenate) are water soluble salts. When used as sill materials, they should be sealed with 6 mil poly from the inside air. Should not be used as decking where direct contact with skin is likely.

Pentachlorophenol (or PCP) is a suspected carcinogen. It is hazardous if absorbed through the skin. PCPs' are not widely used in general applications.

Creosote is an oily distillate of coal tar that remains active for years. It's extremely toxic to wood destroying fungi and insects, which is why its used for railway bridges and ties, wharfs, and other industrial uses. Because it is extremely odorous, it is not an appropriate material to use in residential areas (even if you can get old railway ties for a song!)

Boron, although perhaps the least toxic of all when used as an exterior wood preservative, is subject to leaching.

Flooring

Carpets

Carpeting in general presents a number of problems. New carpet can release as much as 25-30 chemicals into the indoor air. These are mostly chlorinated hydrocarbons used as fungicides and insecticides, as well as fire-retarding agents. The latex bonding in most carpet backing makes up a significant part of the indoor air pollution produced by new carpet. Natural latex can cause skin and allergic reactions due to contact or to its strong odour.

Aside from their initial chemical composition, carpets act as a massive collector of dirt, dust, pollen, food particles, and insect parts and feces. They serve as sanctuary for pet fleas and dust mites (whose extremely friable feces are the single most common allergen inhaled in homes), and can also be a VOC sink for pollutants such as tobacco smoke. Carpet under-padding can be worse sources of VOC's, as can the glues that bond carpet to the sub-floor. If at all possible, avoid the use of wall-to-wall carpet, especially that which is glued.

Synthetic fibres such as polyester, nylon and polypropylene are made from petroleum based compounds. These fibres can off-gas chemicals such as formaldehyde, xylene, benzene, and toluene. Some Polyester fibres are now made from recycled plastic pop bottles.

Wool fibre is durable and naturally fire-resistant, though it is typically treated with insecticides and fungicides.

Cotton is another natural fibre, but unfortunately it depletes the soil quickly and its fibres are prone to attack by many insects. In the finished stage, cotton is treated with fire retarders and stain resistors, as well as fungicides and insecticides.

Carpet Underpad

A natural fibre pad is preferable, but it holds dust, is hard to clean, and may be allergenic to some people.

Vinyl Flooring

Vinyl flooring is available as hard tiles and flexible sheets. Vinyl, which is used in a wide range of household products and toys, is especially hazardous. Sheet flooring is subject to more prolonged off-gassing, due to the plasticizes that keep it flexible, and thus is less chemically stable than the hard variety. PVC can vaporize, releasing the raw material, vinyl chloride monomer, a known carcinogen. Possible alternatives are ceramic tiles, cork or linoleum.

Hardwood flooring

Wood flooring is well-tolerated by the sensitive, it is long-lasting, reusable, and easily-cleaned, providing clean low emissions finishes are used. Depending on the source, it can also be locally-produced from native, sustainably-managed forests.

Ceramic tile

Tile is extremely durable and easy to maintain clean. This is an especially good flooring for the hypersensitive. The major concern with ceramics is that it is a cold floor. However, if used with radiant heating systems it can be extremely comfortable. Small area rugs can also soften the apparent hard cold feel of ceramics.

Paints and Varnishes

Low-tox paints are variations of standard commercial formulations, but with smaller amounts of dangerous ingredients. Generally, it is the pigment that provides the greatest health risk. Pastel shades are usually safer than the darker colours. The major concern is the biocide content.

Water-based paints generally still have toxic ingredients and biocides, but they are less environmentally-damaging than the petroleum-based paints. Latex paints are naturally matt, and the chemicals that are added to make them glossy add to the toxicity.

Urethane is made with isocyanurates in a petroleum-based solvent but it does provide a hard, durable finish. It is toxic to handle, but is generally stable once cured. Water-base urethane or acrylic urethane is better. ☼

We would like to thank Thomas Livingston with assistance provided in the preparation of this item

Efficient Residential Exhaust Ventilation: a more effective way

by David Hill

A home can be exhausted efficiently if the fan(s) which is chosen is installed so that it can perform two independent jobs. It must exhaust odour and moisture generated by human activity (the kitchen/bath) and also exhaust odour, moisture and CO_2 generated by human living.

There are three types of systems that can accomplish both to varying degrees:

a) central exhaust system with fan speed control
b) central exhaust system with separate kitchen and bath fans
c) central exhaust system equipped with zone control

Central exhaust system with fan speed control

In our first efforts to incorporate central exhaust (CEV's, HRV's, etc) into Canadian housing we were primarily concerned with systems that provided continuous air exchange intended to serve the needs of people. We just didn't call it that. We knew that the house needed some ventilation but really had no idea of how the number of bedrooms or occupancy affected air flow rates, and instead sized the system based only on the whole house volume.

At first we thought that by controlling the central exhaust fan's rpm we could raise and lower the air flow adequately to meet the two very different needs of occupants and their activities. We wrestled with that challenge for years, searching the market for appropriate 'speed controllers'. They had to provide a large rpm range between low and high, be reliable, inexpensive and didn't exaggerate the already intrusive fan motor noise.

Many of these 'speed controlled' central systems were sold in the belief that one central fan meets kitchen and bathroom exhaust requirements at high speed and meet background needs at low speed. The central system was somewhat more attractive as their substantially higher initial cost could be partially offset by savings realized by eliminating other fans. Refinements continued along this line for a few years.

However, some installers were finding that even when properly installed, the central systems were not meeting their customer's kitchen and bathroom exhaust expectations. Even when turned to "high" the exhaust draw was not enough. This was especially obvious in homes with three or more bathrooms. This shortcoming was caused by four factors:

1) When switched to high speed, the central exhaust fan's capacity is diluted by exhaust drawn from two or three other grills located in other parts of the home.

2) The air ducts, if used, (it was common practice to use unlined interior wall cavities) were generally so leaky that less than one half of the system's capacity served the exhausted rooms.

3) Initially 3 x 10 and 4 x 10 floor heating registers were used for ventilation exhaust purposes. Due to their large free area they provided no control of airflow, so the exhaust fan running at the lowest continuous rpm drew the majority of its air from only the nearest exhaust grill.

4) A central fan system (especially an HRV with its high internal airflow resistance) has an inherently limited airflow range between continuous and maximum rpm. This characteristic limits the maximum high speed capacity to only approximately twice the continuous rate.

Obviously some of the inadequacies can be overcome today by proper sizing and sealing of the duct system and selection of proper grills. While attempting to solve number 1 and 4 we realized we had reached a technical limitation of existing systems. To solve this, some installers thought they could offer good value by selecting a larger central system to provide the intermittent exhaust punch required. This solution did, in most cases, solve that problem but it created another. The larger system, especially during midwinter, tended to over-ventilate the house and wasted heat even when turned to lowest speed that technology permitted.

Central exhaust system with separate kitchen and bath fans

By this time however, many people were aware of the advantages of continuously operating central systems. This led to the next ventilation evolution. Some were prepared to pay for these central systems based on their merits even though they made less than ideal activity exhaust devices. Others opted to purchase intermittent fans in addition to their central systems.

The reintroduction of separate kitchen and bath fans once again opened up more exhaust choices. If the builder chose to use a range hood he could choose a recirculating type (un-ducted, charcoal, etc.), or outdoor vented unit. If outdoor vented, this exhauster could be an updraft hood, downdraft type, or through the wall design. The updraft design is still the hands-down winner for efficiency and is readily available for all except island range applications. (This is why commercial kitchen exhaust hoods are located over head). There the exhaust system works with, not against, nature by collecting grease, odour and moisture which rises directly off the heated cooking surface.

Continuous exhaust of the kitchen has long since been proven advantageous. A grill located just outside the column of rising grease from the stove (at least 4' horizontally from the cooking surface) will effectively collect odour and moisture when the hood is not in use. It will also serve the living needs of people by providing high level exhaust for the adjacent 'living rooms'.

In the case of the bathrooms, there are no constraints on where the continuous exhaust grill or the bath fan can be located. For maximum efficiency both should be located at the ceiling or high on the wall, possibly over the tub/shower or toilet. This type of system enables the installer to select an appropriate small central ventilator to provide ventilation for living needs yet still provide the expected exhaust performance in these 'activity rooms'.

Another question still remains. Should the bath fan be ducted directly to the outdoors or tied into the central system? At first glance the latter method looks like the best solution as it avoids cutting more holes into the exterior envelope of the house minimizing winter infiltration/exfiltration problems. However, there are still problems: poor proportioning (division of the exhaust capacity between the kitchen and bathrooms) and control wiring complexity.

For twenty-three and one half hours of each day that it is not operated, each commonly connected bath fan becomes a regular 'exhaust grill' for the central system. Because each of these has a much larger free area than appropriate ventilation grills, the same old problem of poor proportioning reappears. Secondly the electrical control becomes difficult as the central system should be switched to maximum whenever the individual fans are switched on. If this latter step is not done and the bath fan is a good quality one (85 - 100 actual cfm), there is a risk that during use odour and moisture will simply be transferred from the occupied bathroom to the adjacent unused one. This is why when bath fans are installed in homes with a central ventilation system, it is far better to install each independently, ducting each directly to the exterior.

Central exhaust system with zone controls

The proven willingness of some homeowners to reintroduce bath fans into homes where central a exhaust ventilation system was already budgeted for, created an opening for innovative new technology. The problem is to find a better way to control the central exhaust airflow from specific rooms.

The solution is called '**exhaust zoning**'. By fully opening the exhaust grill from its normal partially open position, the air drawn from that one bathroom can be substantially increased. This temporarily reduces the exhaust from the other unused activity rooms, but has minimal effect on the overall system. This option enables one central system to perform both continuous and spot jobs effectively. This already improved exhaust rate can be doubled if the fan is simultaneously switched to high speed from its continuous rpm. When both effects are compounded, the practical result is that the temporary bathroom exhaust airflow can be boosted approximately eight times its continuous rate.

The other benefit of this approach is that the continuous exhaust rate of the central fan can be reduced. The partially open exhaust grills add a slight drag to the exhaust airflow. This is a definite winter time benefit as an energy saving measure.

We must continually return to basics and ask our customers what is their REAL NEED. If we listen carefully and consider their answers, we will be soon recognize that there are two requirements of a residential exhaust system.

As professionals in ventilation we must meet both of them and select from available hardware to accomplish these jobs. ☼

David Hill is President of Eneready Products Ltd. a residential ventilation systems distribution company in Burnaby, B.C.

Technical Research Committee News

Canadian
Home Builders'
Association

Flooring Problems: Telegraphing of Underlays

We've reported in the past on problems associated with the telegraphing of flooring underlay seams through the finish flooring, mostly in resilient floors.

These problems don't seem to be going away. Ross Monsour is gathering information about the problems. that are happening in the field. If you've encountered problems, let Ross know. He needs detailed information about the nature of the problem, as well as specifics of products used (materials specification for both finish flooring and underlay), construction details, adhesives, thickness or weight of materials, installation practices. etc. It could be that some problems are product specific, so the more information we receive, the easier it will be to deal with the causes so that the problems can be eliminated once and for all. All contributions will be kept confidential.

Floor Manual

Telegraphing of underlays is only one problem. The best solution to minimizing problems is to avoid the potential for problems by doing it right the first time.

A couple of years ago a rash of flooring problems on the Prairies prompted the Saskatchewan government to fund a research project carried out by the Saskatchewan Research Council to determine the nature of flooring problems. One of the main recommendations was for the production of a guide to address the entire floor system including causes of various problems, and how they can be avoided or resolved. As a result, an excellent manual has been produced and is being marketed by the Saskatchewan Home Builder Association.

(It may be one of the better kept secrets)

Copies are available for only $12 plus GST and shipping and handling. For information: Saskatchewan Home Builders Association, 1801 Mackay St., Regina, SK S4N 6E7
Tel: 306-569-2424; FAX 306-569-9144

Advisory Committee on Materials emissions

To improve indoor air quality, it is best to avoid using some products indoors, in other words, eliminate the source of the problem before it becomes one.

How do you know what is acceptable and what is not? How can you predict the impact of certain products? What about the cumulative effect of the emissions of a number of products on the indoor environment? Is it possible to predict the emission rate and their impact? Can you test for emissions?

Development of data banks, guidelines for their use, and prediction tools are only some of the issues that are to be considered by this new committee. It has attracted the interest of the US Environmental Protection Agency (EPA) who will be participating.

The issue is so big, and potentially significant, that the National Research Council is building a large and small test chamber for materials testing.

Anyone interested in this issue, can contact Dr. Jianshun Zhang, Project Manager, Building Performance Laboratory, National Research Council, Ottawa, ON K1A 0R6 FAX 613-954-3733

National Energy Code

The next draft of the code is due to be issued shortly. It is going to impact everyone, so if you have concerns, be sure to review the code when it is issued.

EnviroHome

The goal of the EnviroHome Initiative is to promote new homes that incorporate commercially available, environmentally preferred technologies, products and materials. Envirohomes must meet R-2000 construction standards for an energy efficient and a healthy indoor environment, as well as environmentally responsible approaches to landscaping and construction waste management. They show consumers that many advanced housing features are "here and now" - available, affordable and reliable.

Two prototype Envirohomes were built last year - one in Edmonton, the other in Saint John, N.B.

What's been the builders' reaction? Dough Bracken of Challenger Homes in Edmonton said "we feel that by initiating leading edge technology we demonstrate to the public we're at the front of the pack and this pays off in the long run. It's also important to get away from the price game - to sell on value rather than just on price. The EnviroHome was an important way for out team to show the public that home builder's are a responsible part of the community.

People are very curious about the idea of an environmentally improved home but they are not really aware of what all the possibilities are. They learn that an EnviroHome doesn't have to be the "granola" approach. It's warm, secure, healthy and comfortable environment to live in. And it's cost-effective."

Advice Doug Bracken gives to other builders is to look for locally available materials. they began by looking farther afield and ended up finding many suitable products close to home.

Wayne Moore of Moore Homes in Saint John N.B. built the EnviroHome in Saint John. It is one of the 44 unit condominium projects.

Wayne says that "last year I built a home for a customer who has environmental hypersensitivities and this got me interested in the whole area of indoor air quality and healthy housing.

"The EnviroHome initiative has definitely been a benefit for my company. I'm sitting in a flat market and I'm selling homes (16 units have already been sold all built to Envirohome standards). Everybody is interested in the environment and in living in a healthier home.

"Public reaction has been enthusiastic. Visitors feel the time has come for the housing industry to make the environment a higher priority and they see this as something concrete. We tried to stay somewhat middle-of-the-road and simply incorporate things that we knew made sense."

What advice does Wayne have for other builders?

"Be careful and moderate about creating expectations about these types of homes. Living in a healthy house won't cure someone of their allergies; but it will provide a healthier and more comfortable environment to live in."

For details of the Envirohome program contact John Broniek at CHBA National Office.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. If you have any problems, technical questions, or suggestions for areas that need to be investigated, you are encouraged to contact your local Home Builders' Association technical committee or the TRC directly at:
Canadian Home Builders' Association, Suite 200, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214

Letters to the Editor

Re: "The Simple House", (Solplan Review, January 1995)

I read with much joy Dr. Ted Kesik's article on The Simple House and was compelled to respond and endorse many of his ideas and add our experience to the discussion.

Prior to the Advanced House Program in the early 90's our Dept. submitted a proposal to the Federal Department of Natural Resources for a project entitled "The Achievable Technology House" with a mandate for affordable and environmentally appropriate energy efficient technology. The concepts of that house were derived from the experience gained in this department through the last decade with the CREDDA Program and the R-2000 Program. It was not necessarily our goal to exceed the energy performance of the typical R-2000 home, but to design a housing concept that is less expensive, more architecturally efficient, potentially owner built and still provide energy performance to exceed the standard new housing stock. Needless to say this idea did not tickle the fancies of the NRCan techno-junkies.

With this experience under our belts it was with some anxiety that we participated as part of the Newfoundland Advanced House Proposal Team wherein we proposed a design implementing ground source heat pump technology, a modest architectural design with expansion capabilities built in for an in-law apartment and accessibility, spray urethane insulation and a host of other bells and whistles as required by the Advanced House Program. Again unfortunately this proposal was not accepted on the basis of a technology bias. This has unfortunately led to no construction of an Advanced House in the Province of Newfoundland.

As a group of designers we have always felt that the emphasis in efficient housing has been somewhat misplaced leading to the construction of Energy Efficient Houses for the elite and or international showcase. Unfortunately the lower income people of this country have not had the opportunity to participate in owning such a home. Evidence can be found to support this in the dismal numbers of R-2000 homes built in this province because they are viewed as to expensive for many of the population in serious need of housing.

This turn of events has not deterred me personally from pursuing the goal of an Achievable Technology Home. As a private citizen over the past years I have built and sold several homes aspiring to these goals. I have addressed architecture by implementing aspects of early American design like the saltbox and married this to the concept of multiple use areas as is found in traditional Japanese housing and created most recently a 1450 sq. ft. home for a family of four with ample useable space. From a construction perspective I have used a shallow buried frost protected slab on grade foundation utilizing in floor hot water radiation; 24" modular frame construction eliminating all exterior sheathing materials; and ventilation by means of central exhaust with passive air inlet. I have just recently occupied this home and will continue to monitor its performance in future years. Excluding the land on which this house is sited a total construction cost of less than $55,000 was incurred bringing the sq. ft. cost down to a respectable $38. This is very good given the high cost of construction materials in this province due to transportation. Should we include the cost of a serviced, landscaped building lot in the St. John's metropolitan area at $40,000 the total cost rises to $95,000, still putting the total cost at less than $66 per sq. ft. (That's Canadian dollars don't forget!)

In closing I must again endorse Dr. Kesik for his insight in this area which we have recognized for some time. I agree with him that knocking the Advance House Program now would be mute, but I am sure they are listening. We need to promote the concept of Achievable Technologies Housing for immediate implementation into the housing market. If the people at NRCan, CMHC, and others are listening, let get together and develop this package so the average citizen can have one of these homes supported by these federal authorities and funded through provincial housing authorities, co-op programs and the Canadian lending Institutions.

I hope to hear more on this issue in the future from like mined designers such as Joe Lstiburek, Don Roscoe, Elizabeth White and others.

Robert Osmond
Residential Energy Advisor
Department of Natural Resources
Government of Newfoundland and Labrador.

Re: Thermal Resistance Values (Solplan Review Oct-Nov 1994)

I have been re-reading the Oct/Nov 1994 issue of Solplan Review, and in particular the letter from Eric MacNearney, P.Eng. concerning the table on effective R values you printed in the Aug/Sept issue.

Why would the owner and inventor of a product as inherently versatile as Insul-Wall wish to restrict the availability to two thicknesses, and therefore R values, when insulation needs, practices and codes vary across the country? For example, The B.C. Building code has a requirement of R14, R20 and R22, depending on heating fuel and climate zone. Surely, if the opportunity arose, an out-of province manufacturer of a wall system wouldn't turn down the order if it meant having to reduce the insulation thickness below what he feels is correct for the area where he lives? And if a builder and his electrician express a particular aversion to gouging out recesses in the polystyrene for electrical boxes, and would prefer a deeper cavity in the wall that could later be filled with flexible insulation, wouldn't the wall system manufacturer try to give the customer what he wants? Didn't Henry Ford's dictum, "You can have any colour you want as long as it's black" cost him business?

By using the equivalency provision in the B.C. Building Code, employing good engineering practices, I calculate that the Insul-Wall system with 4.5" thick styrene (R4/inch) would be equivalent to the RSI 3.5 (R20) nominal wall in Table 9.25.2.A. of the Code. This saves 10% of the insulation of the standard 5" Insul-Wall. (The labour to install it is the same, so the total saving to the home buyer on an installed basis is less than 10% and may well be false economy, but when competition gets down and dirty, every penny counts).

To be competitive in this world you have to be flexible, and provide the customer with what they want. I think a good motto for the suppliers of these wall systems would be " You can have anything you want as long as it's white". (With apologies to Dow and Celfort, and thanks to Henry Ford).

George Pinch P.Eng
Vancouver, B.C,

Coming Events

Heating, Refrigerating And Air Conditioning Institute Of Canada (HRAI) has published their 1995 Winter/Spring Course Schedule
Courses include:
Residential Mechanical Ventilation Installation (2 Day Course), Residential Mechanical Ventilation Design (2 Day Course), Residential Heat Loss & Heat Gain Calculation (3 Day Course), Residential Air System Design (3 Day Course), Small Commercial Heat Gain & Heat Loss Calculations (3 Day Course)
Information:
Tel: 905 602-4700 or 1-800-267-2231

May 10 - 12, 1995
Indoor air Quality, Ventilation and Energy Conservation in Buildings 2nd International Technical Conference. Montreal, Canada
Organized by Centre for Building Studies , Concordia University
Tel: (514) 848-3200
Fax: (514) 848-7965

June 5 - 6, 1995
Window Innovations '95
Toronto, Ontario
An International Conference on Window Technologies for Energy Efficiency in Buildings; sponsored by Natural Resources Canada/CANMET in cooperation with the International Energy Agency.
Information: Darinka Tolot
Natural Resources Canada/CANMET
580 Booth Street, Ottawa, Ontario K1A 0E4
Tel: (613) 943-2259
Fax: (613) 996-9416

December 4 - 8, 1995
Thermal Performance Of The Exterior Envelopes Of Buildings VI
Research, advanced technologies, new concepts, practical applications and case studies.
Oak Ridge National Laboratory
Thermal Envelopes Conference
Box 2008, Bldg 3147
Oak Ridge, Tennessee 37831-6070
Attn: Pat Love

Solar Wind & Water Power
A series of workshops offering hands-on instruction. For details:
Solar Energy International
Box 715
Carbondale CO 81623
Tel 303-963-8855

Back Issues

A selection of key articles in recent issues includes:

Solplan Review No. 59
Stucco Problems
Efficient & effective ventilation
HOT 2000 v 7 review
R-2000 Technical Standards

Solplan Review No. 58
Efficient Lighting
Thermal resistance values
Duct cleaning: is it worth it?
Combo space heating systems
R-2000 and new energy codes: is there s difference?
Environmentally Friendly Products sources

Solplan Review No. 57
Passive solar heating
Air Barrier Systems Details
The Importance of Dry Lumber
Defect Prevention
How Big is our Ecological Footprint?

Solplan Review No. 56
Frost Protected Shallow Foundations
Three faces of Residential ventilation:
New R-2000 Technical Requirements
Composting Toilets
Environmental Choices for homebuilders and renovators

A full index to the first 49 issues was printed in issue No 50. A limited number of back issues are still available, at a special price of $4.50 each.

Bundle special: we have a limited number of back issues (minimum of 22 copies, random selection) for only $ 50.00

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Signage: Less is more

According to sign industry trade publications, a pedestrian has eleven seconds to read your sign, a passing motorist has just three seconds. Jamming lots of copy onto your signage not only increases the cost, but also reduces readability.

Signage is impact advertising. It doesn't need lots of copy.

While pruning your copy is important don't forget your main message. The most important word in "Joe's Garage" is Garage (sorry Joe).

Marketing signage, such as commercial real estate signage, may include a "Features List" in bullet form, but it's the Impact Copy that draws the reader for a closer look. If your project marketing is price-driven, then emphasize, Attractively Price From ...". If it's location-driven use, "View For Sale", etc. Your purchaser may be ambivalent about the "Fully Sprinklered Gardens" if s/he's shopping price tags.

What's The Capital...?

The mind processes large text vertically (cap height), not horizontally. the following chart can be used to gauge the letter heights required on your sign for readability and maximum impact:

Letter Visibility Chart

Maximum readable distance	Readability distance for maximum impact	Letter height
100'	30'	3"
200'	60'	6"
400'	90'	9"
525'	120'	12"
750'	180'	18"
1000'	240'	24"
1500'	360'	36"
2000'	480'	48"

Ontario R-2000 Awards for Technical Excellence in Housing

The R-2000 Program in Ontario has created an awards program to recognize those builders who exemplify the R-2000 spirit through increased energy efficiency, improved air quality and environmental responsibility.

The award is also meant to increase consumer activity in the marketplace for R-2000. The awards will be presented at the January Ontario Builder Forum.

For information, contact the Ontario R-2000 Program Management Office
Tel 416-447-0077
FAX 416-443-9982